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January 31, 2003

Arizona Corporation Commission
Utilities Division
1210 West Washington
Phoenix, Arizona, 85007

E-00000D-03-0047

Gentlemen:
Enclosed are fourteen copies of "Ten Year Plans" for both Tucson Electric Power Company (TEP) and UNS Electric submitted by TEP in compliance with Title 40, Chapter 2, Article 6.2 of the Arizona Revised Statutes known as Power Plant and Transmission Line Siting Committee.

Please acknowledge receipt by returning a copy of this letter.

Sincerely,

Ed Beck

Ed Beck
Supervisor, Transmission Planning and Administration

Bcc: M. Jerden
J. Pignatelli
J. Pyers
S. Glaser
M. Flores
B. Darmitzel

Arizona Corporation Commission
DOCKETED
FEB 02 2004
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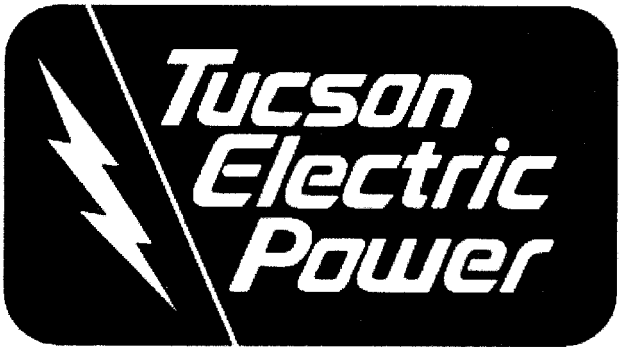


A UniSource Energy Company

TUCSON ELECTRIC POWER COMPANY
TEN YEAR PLAN
FOR YEARS
2004-2013

SUBMITTED TO THE
ARIZONA CORPORATION COMMISSION
JANUARY 2004

DOCKET NO: E-00000D-03-0047

CONTENTS

INTRODUCTION

EHV Transmission System

CENTRAL ARIZONA TRANSMISSION SYSTEM (CATS) STUDY

The CATS Phase I and Phase II studies were collaborative regional transmission studies with the purpose of developing a high-level transmission plan for Central Arizona with the objective of maximizing regional benefits while developing a plan that makes more efficient use of the existing transmission system. These studies were only comparative analyses of the transmission system and were not representative of a specific time frame.

The CATS Phase III Study is a regional transmission collaborative effort with the purpose of developing a ten-year transmission plan for Central Arizona. The objective of the CATS Phase III Study was to develop a new process that would take each participant's individual ten-year plans and analyze how they perform in a regional environment with the end result being a coordinated ten-year regional plan for Central Arizona. The Salt River Project (SRP), on behalf of all participating utilities, has filed the CATS Phase III report with the Arizona Corporation Commission (ACC). The EHV projects listed in the following summary sheets reflect the analysis effort of CATS.

138kV Local Transmission System

TEP performs an annual review of its 138kV system performance over a ten-year planning horizon. This results in a schedule for new facilities and upgrades to existing facilities assuring adequate transmission capacity within TEP's service territory as Tucson continues to grow. TEP's 138kV system is improved to accommodate new 138 / 14kV substations and increased line loading.

Load projection analysis looks at distribution system shortfalls and identifies the impact of load growth at each of TEP's distribution substations. This results in requirements for new 138/13.8 kV substations and new 138kV transmission lines. Load projection also provides input to the power flow analysis used to identify thermal overloads.

Power flow analysis looks for thermal overloads during normal and contingency operation based on WECC/NERC Level A, B and C reliability criteria. Contingencies include:

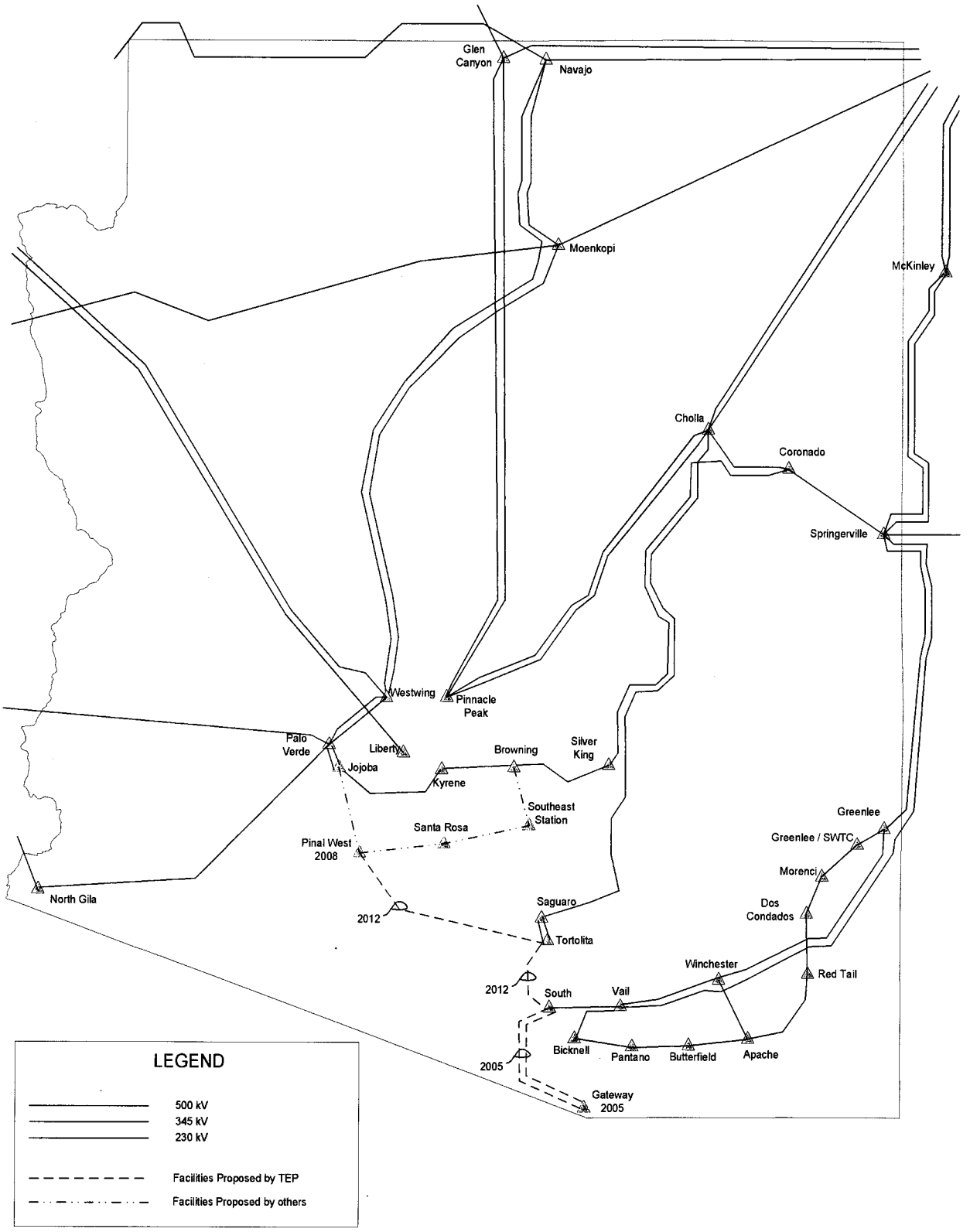
- Loss of major EHV import
- Loss of critical local generation
- Single 138kV circuit outages
- Credible 138kV multiple circuit outages
- Critical circuits initially out of service with system operating acceptably followed by a subsequent outage.

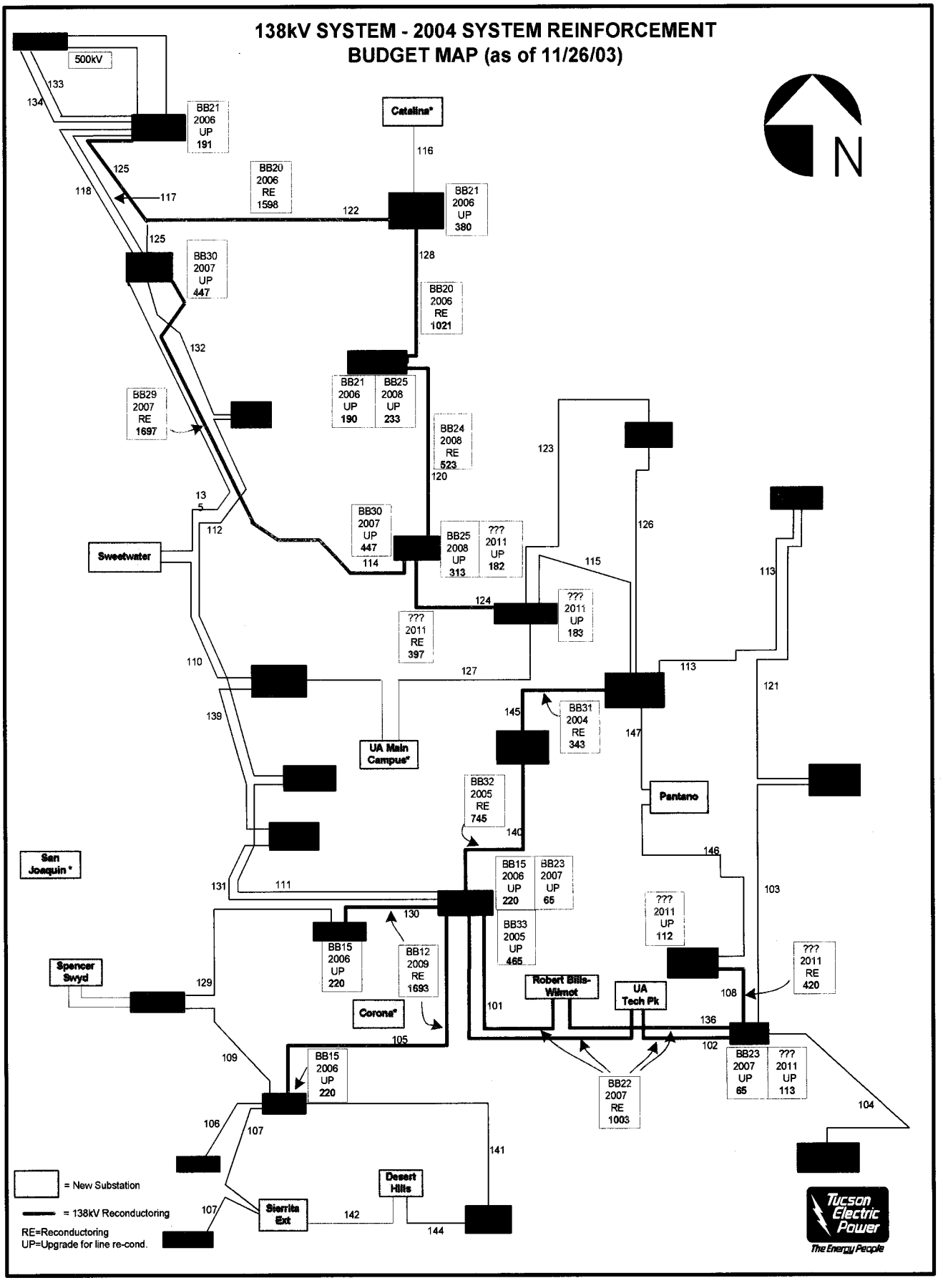
Thermal overloads are addressed with:

- New transmission lines
- Uprating existing lines (increase NESC clearances or larger ampacity wire)
- New generation (when more economical than transmission)

Transmission facilities are also added at 138kV to increase reliability at substations that are served radially.

Planned TEP EHV Transmission Facilities
2004 - 2013




138kV SYSTEM - 2004 SYSTEM REINFORCEMENT
BUDGET MAP (as of 11/26/03)
N
500kV
133
134
BB21 2006 UP 191
Catalina*
116
125
118
117
BB20 2006 RE 1598
122
BB21 2006 UP 380
125
BB30 2007 UP 447
128
BB20 2006 RE 1021
132
BB21 2006 UP 190
BB25 2008 UP 233
BB29 2007 RE 1697
BB24 2008 RE 523
120
123
13 5
112
BB30 2007 UP 447
114
BB25 2008 UP 313
??? 2011 UP 182
Sweetwater
126
115
113
124
??? 2011 UP 183
??? 2011 RE 397
110
127
113
121
139
145
BB31 2004 RE 343
147
UA Main Campus*
BB32 2005 RE 745
Pantano
140
146
San Joaquin *
131
111
BB15 2006 UP 220
BB23 2007 UP 65
BB33 2005 UP 465
130
??? 2011 UP 112
103
BB15 2006 UP 220
BB12 2009 RE 1693
??? 2011 RE 420
Spencer Swyd
129
Robert Bills-Wilmot
UA Tech Pk
108
101
Corona*
136
105
102
109
BB15 2006 UP 220
BB23 2007 UP 65
??? 2011 UP 113
BB22 2007 RE 1003
104
106
107
141
= New Substation
= 138kV Reconductoring
RE=Reconductoring
UP=Upgrade for line re-cond.
Desert Hills
107
Sierrita Ext
142
144
Tucson Electric Power
The Energy People

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Interconnection of Westwing – South 345 kV with future Jojoba – Southeast Station 500 kV via new Pinal West 500/345 kV Substation
Size	
a) Voltage	345-kV
b) Capacity	System dependent
c) Point of Origin	N/A
d) Point of Termination	Future Pinal West substation
e) Length	Less than 1 mile
Routing	Adjacent to Westwing – South 345 kV line.
Purpose	To reinforce Tucson Electric Power Company's EHV system and to provide a higher capacity link for the flow of power from the Palo Verde area into TEP's service territory.
Date	
a) Construction Start	2007
b) In-Service Date	2008
Is Certificate Necessary	Yes, Siting Case #124 - pending
Technical Studies	Studies in progress via CATS, WATS, and Palo Verde – Southeast Station study groups.

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Pinal West Substation to Tortolita Substation
Size	
a) Voltage	500-kV
b) Capacity	System dependent
c) Point of Origin	Future Pinal West substation
d) Point of Termination	Tortolita Substation (Sec. 14 T10S R10E)
e) Length	Approximately 60 miles
Routing	Unknown
Purpose	To reinforce Tucson Electric Power Company's EHV system and to provide a higher capacity link for the flow of power from the Palo Verde area into TEP's northern service territory.
Date	
a) Construction Start	2011
b) In-Service Date	2012
Is Certificate Necessary	Yes
Technical Studies	Studies in progress via CATS

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Tortolita Station to Winchester Station
Size	
a) Voltage	500-kV
b) Capacity	System dependent
c) Point of Origin	Tortolita Substation (Sec. 14 T10S R10E)
d) Point of Termination	Winchester Substation
e) Length	Approximately 80 miles
Routing	As described in Case no. 23
Purpose	To reinforce Tucson Electric Power Company's EHV system and to provide a higher capacity link for the flow of power from the Palo Verde area into TEP's eastern transmission system.
Date	
a) Construction Start	Under Review
b) In-Service Date	Under Review
Is Certificate Necessary	Yes
Technical Studies	Studies in progress via CATS and internal TEP study efforts.

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Winchester Substation to Vail Substation – 2nd circuit
Size	
a) Voltage	345-kV
b) Capacity	System dependent
c) Point of Origin	Winchester Subtation
d) Point of Termination	Vail Substation (Sec. 4 T16S R15E)
e) Length	Approximately 40 miles
Routing	Parallel to existing Greenlee – Vail Line
Purpose	To reinforce Tucson Electric Power Company's EHV system and to provide additional transmission capacity from the future Winchester Station into Tucson
Date	
a) Construction Start	Under Review
b) In-Service Date	Under Review
Is Certificate Necessary	Yes
Technical Studies	Studies in progress via CATS and internal TEP study efforts.

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Vail Station to South Station – 2nd circuit
Size	
a) Voltage	345-kV
b) Capacity	System dependent
c) Point of Origin	Vail Substation (Sec. 4 T16S R15E)
d) Point of Termination	South Substation (Sec. 36 T16S R13E)
e) Length	14 miles
Routing	Parallel to existing Vail – South Line
Purpose	To reinforce Tucson Electric Power Company's EHV system and to provide additional transmission capacity between Vail and South Substations
Date	
a) Construction Start	Under Review
b) In-Service Date	Under Review
Is Certificate Necessary	No – Predates siting requirements
Technical Studies	Studies in progress via CATS and internal TEP study efforts.

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

[Note: This project completed in 2003]

Line Designation	Saguaro Substation to Tortolita Substation – 2nd circuit.
Size	
a) Voltage	500-kV
b) Capacity	System dependent
c) Point of Origin	Saguaro Substation (Sec. 15 T10S R10E)
d) Point of Termination	Tortolita Substation (Sec. 14 T10S R10E)
e) Length	1 Mile
Routing	Parallel to existing Saguaro to Tortolita line.
Purpose	To reinforce Tucson Electric Power Company's EHV system and to provide a higher capacity link for the flow of power from Saguaro Substation into TEP's service territory.
Date	
a) Construction Start	2003
b) In-Service Date	June 2003
Is Certificate Necessary	Yes, siting case no. 39
Technical Studies	See record of siting case no. 39. TEP has updated studies available upon request.

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Springerville Substation to Greenlee Substation.
Size	
a) Voltage	345-kV
b) Capacity	System dependent
c) Point of Origin	Springerville Substation (Sec. 34 T11N R30E)
d) Point of Termination	Greenlee Substation (Sec. 29 T5S R31E)
e) Length	110 Miles - 27 Miles in Arizona.
Routing	Parallel to existing Springerville to Greenlee line.
Purpose	To deliver power and energy from major TEP interconnections in the Four Corners and Eastern Arizona regions.
Date	
a) Construction Start	Under Study
b) In-Service Date	Under Study
Is Certificate Necessary	Issued in 1975, 1977, 1982 and 1986
Technical Studies	Base studies conducted in coordination with neighboring utilities formed the basis for the design of TEP's original EHV system in the 70's. This project is based on that original work. Detailed studies will be developed in the future upon a determination of need for this project by TEP.

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Tortolita Substation to South Substation.
Size	
a) Voltage	345-kV
b) Capacity	System dependent
c) Point of Origin	Tortolita Substation (Sec. 23 T10S R10E)
d) Point of Termination	South Substation (Sec. 36 T16S R13E)
e) Length	68 Miles
Routing	From Tortolita Substation south through Avra Valley to existing Westwing-South 345-kV transmission line right-of-way, then parallel to existing Westwing – South line to South Substation.
Purpose	To reinforce Tucson Electric Power Company's EHV system and to provide a high capacity link for the flow of power in Southern Arizona.
Date	
a) Construction Start	Under Review
b) In-Service Date	Under Review
Is Certificate Necessary	Yes, Siting Case #50
Technical Studies	Being re-evaluated as part of CATS study

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Westwing Substation to South Substation (2nd circuit)
Size	
a) Voltage	345-kV
b) Capacity	System dependent
c) Point of Origin	Westwing Substation (Sec. 12 T4N R1W)
d) Point of Termination	South Substation (Sec. 36 T16S R13E)
e) Length	178 Miles
Routing	Parallel to existing Westwing to South line.
Purpose	To deliver power and energy from major TEP interconnections in the Northwest Phoenix region.
Date	
a) Construction Start	Under Review
b) In-Service Date	Under Review
Is Certificate Necessary	No – See Case No. 15
Technical Studies	Base studies conducted in coordination with neighboring utilities formed the basis for the design of TEP's original EHV system in the very early 70's. This project is based on that original work. Detailed studies will be developed in the future upon a determination of need for this project by TEP.

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	TEP-Citizens 345 kV Interconnection Line--South Substation to future Gateway Substation (2 ckts.)
Size	
a) Voltage	345-kV
b) Capacity	500 MW
c) Point of Origin	South Substation (Sec. 36 T16S R13E)
d) Points of Termination	Gateway Substation in (Sec. 12 T24S R13E)
e) Length	Approximately 60 Miles
Routing	Southerly from South Substation, in or near the Santa Cruz Valley to Nogales area.
Purpose	To provide an alternate transmission path to Citizen's Communication Company in Nogales, Arizona pursuant to ACC order.
Date	
a) Construction Start	Dependent upon permitting
b) In-Service Date	2005 – Anticipated date
Is Certificate Necessary	Yes, Siting Case #111
Technical Studies	See record of Siting Case in no. 111

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Gateway Substation to Comision Federal de Electricidad (CFE) (2 ckts.)
Size	
a) Voltage	345-kV
b) Capacity	500 MW
c) Point of Origin	Gateway Substation (Sec. 12 T24S R13E)
d) Points of Termination	Arizona-Sonora boundary (Sec. 13 T24S R13E)
e) Length	Approximately 2 Miles
Routing	Southerly from Gateway Substation, in or near the Nogales area.
Purpose	To interconnect to the Comision Federal de Electricidad in Sonora, Mexico.
Date	
a) Construction Start	Dependent upon permitting
b) In-Service Date	Undetermined
Is Certificate Necessary	Yes, Siting Case #111
Technical Studies	See record of siting case no. 111

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

[Note: This project is currently under construction]

Line Designation	Loop-in of TEP Winchester Switchyard
Size	
a) Voltage	345-kV
b) Capacity	System Dependant
c) Point of Origin	Existing Greenlee – Vail 345 kV line Northeast of Pomerene, Arizona
d) Points of Termination	New Winchester Substation
e) Length	Less than 1 Mile
Routing	Southeasterly from existing TEP 345 kV Greenlee – Vail transmission line.
Purpose	To provide for interconnection of Southwest Transmission Cooperative 230 kV line.
Date	
a) Construction Start	2003
b) In-Service Date	2004
Is Certificate Necessary	Yes, Siting Case #121
Technical Studies	Study results provided to ACC by Southwest Transmission Cooperative – See Case No. 121

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Irvington Substation to East Loop Substation (through 22nd Street Substation).	
Size		
a) Voltage	138-kV	
b) Capacity	System dependent	
c) Point of Origin	Irvington Substation (Sec. 03 T15S R14E)	
d) Point of Termination	East Loop Substation (Sec. 08 T14S R15E)	
e) Length	9 Miles	
Routing	North and East of Irvington Substation, through 22nd Street Substation, then East and North to East Loop Substation.	
Purpose	To provide additional electric service to the central area of Tucson Electric Power Company's service area and to reinforce the local transmission system.	
Date		
a) Construction Start	1985	
b) In-Service Date	Phase 1 – 1994 (Completed)	Irvington Sta- tion to 22nd St. Substation
	Phase 2 – 2000 (Completed)	22nd St. Substation to East Loop Substation
	Phase 3 – Under Review	2nd Circuit of Phase I
Is Certificate Necessary	Yes, Siting Case #66	

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation		Vail Substation to East Loop Substation (through Houghton Loop Switching Station*, Spanish Trail and Roberts Substations).
Size		
	a) Voltage	138-kV
	b) Capacity	System dependent
	c) Point of Origin	Vail Substation (Sec. 4 T16S R15E)
	d) Point of Termination	East Loop Substation (Sec. 8 T14S R15E)
	e) Length	22 Miles
Routing		East and north from Vail Substation along existing transmission line to Irvington and Houghton Roads, then north along Houghton Road to Speedway Boulevard, then east and north to Roberts Substation and west along Speedway to East Loop Substation.
Purpose		To provide additional electric service to the eastern portion of Tucson Electric Power Company's service area and to reinforce the local transmission system.
Date		
	a) Construction Start	1976
	b) In-Service Date	Phase 1 - 1977 (Completed) — Spanish Trail Substation and 138-kV lines to East Loop and Vail Substation
		Phase 2 - 1983 (Completed) — Roberts Substation and associated 138-kV lines

	Phase 3 – Under Review	Third 138-kV line from Vail to East Loop Substation
Is Certificate Necessary	Yes, Siting Case #8 (Issued in 1973, 1976 and 1982)	

*Houghton Loop switching station has been removed from TEP's plans. Name retained for reference only.

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	East Loop Substation to Northeast Substation (through Snyder Substation)
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	East Loop Substation Sec. (8 T14S R15E)
d) Point of Termination	Northeast Substation Sec. (28 T13S R14E)
e) Length	13 Miles
Routing	North and west of East Loop Substation, then south and west to termination point.
Purpose	To provide additional electric service to the northeastern area of Tucson Electric Power Company's service area.
Date	
a) Construction Start	1985
b) In-Service Date	Phase 1 - 1987 (Completed) — Snyder Substation and 138-kV line to East Loop Substation Phase 2 – 1999-2005 — 138-kV line from Snyder Substation to Northeast Substation (Interim line in service. Final completion date dependent upon public improvements)
Is Certificate Necessary	Yes, Siting Case #47

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Loop existing North Loop Substation to DeMoss Petrie Station line through Sweetwater Substation.
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Sec. 20 T13S R13E
d) Point of Termination	Sec. 20 T13S R13E
e) Length	Less than one mile
Routing	Loop existing line at Sweetwater (Roger Road) and Santa Cruz River; west on Sweetwater Road into future Sweetwater Substation.
Purpose	To provide additional electric service to the western part of Tucson Electric Power Company's service area and to reinforce the local distribution system.
Date	
a) Construction Start	Under Review
b) In-Service Date	Under Review
Is Certificate Necessary	Yes, Siting Case #62

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Loop existing Irvington Station to Vail Substation #1 line through Robert Bills –Wilmot (formerly Littletown) Substation.
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Vail – Irvington Corridor (Sec. 36 T15S R14E)
d) Point of Termination	Robert Bills – Wilmot Substation (Sec. 23 T15S R14E)
e) Length	Approximately 3 Miles of double-circuited line.
Routing	Loop existing north line west of Vail Substation along the west side of Wilmot Road approximately 1.5 miles into future Robert Bills – Wilmot Substation
Purpose	To provide additional electric service to the south-central part of Tucson Electric Power Company's service area.
Date	
a) Construction Start	2004
b) In-Service Date	2005
Is Certificate Necessary	Yes, Siting Case #123

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Loop existing Vail Substation to East Loop Substation line through future Pantano and Los Reales Substations.
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Phase 1: Sec. 24, T15S R15E Phase 2: Sec. 28, T14S R15E
d) Point of Termination	Phase 1: Sec. 24, T15S R15E Phase 2: Sec. 28, T14S R15E
e) Length	Substations are less than one span from the existing line.
Routing	Phase 1 Loop existing line east of Houghton Road and south of Valencia Road through Los Reales Substation. Phase 2 Loop existing line east of Pantano Road and south of Golf Links through Pantano Substation.
Purpose	To provide additional electric service to the eastern part of Tucson Electric Power Company's service area and to reinforce the local distribution system.
Date	
a) Construction Start	2001
b) In-Service Date	Phase 1 – Completed Phase 2 - 2011
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Extend 138-kV line from Midvale Substation through future Spencer Switchyard to future San Joaquin Sub-station.
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Midvale Substation (Sec. 3 T15S R13E)
d) Point of Termination	Future San Joaquin Substation (physical location to be determined
e) Length	Approximately 20 miles
Routing	Reviewing use of common utility corridor and existing subtransmission
Purpose	To provide additional electrical service to the far western portion of Tucson Electric Power Company's service area and to reinforce the local distribution system.
Date	
a) Construction Start	Under Review
b) In-Service Date	Under Review
Is Certificate Necessary	Under Review

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	South Substation to DeMoss Petrie Substation
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	South Substation (Sec. 36 T16S R13E)
d) Point of Termination	DMP Substation (Sec. 35 T13S R13E)
e) Length	Approximately 18 miles
Routing	Unknown
Purpose	To reinforce Tucson Electric Power Company's 138kV system and to provide additional service to the western part of Tucson Electric Power Company's service area.
Date	
a) Construction Start	Under Review
b) In-Service Date	Under Review
Is Certificate Necessary	Yes

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	South Substation to Cyprus Sierrita Extension Switchyard through future Desert Hills Substation and Green Valley Substation.	
Size		
a) Voltage	138-kV	
b) Capacity	System dependent	
c) Point of Origin	South Substation (Sec. 36 T16S R13E)	
d) Point of Termination	Cyprus-Sierrita Extension Switchyard (Sec. 10 T18S R12E)	
e) Length	Approximately 24 miles	
Routing	Reviewing use of existing subtransmission route.	
Purpose	To provide additional electrical service to southern area of Tucson Electric Power Company's service area and to reinforce the local transmission & distribution system.	
Date		
a) Construction Start	1995	
b) In-Service Date	Phase 1 -1997 (Completed)	South 138-kV line to Green Valley.
	Phase 2 -2006	138-kV line from Green Valley through future Desert Hills Substation to future Cyprus-Sierrita substation
Is Certificate Necessary	Yes, Siting Case #84	

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Rancho Vistoso Substation to future Catalina Substation
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Rancho Vistoso Substation (Sec. 36 T11S R13E)
d) Point of Termination	Future Catalina Substation (physical location to be determined)
e) Length	Approximately 7 Miles
Routing	Reviewing partial use of WAPA corridor
Purpose	To provide additional electrical service to far northern area of Tucson Electric Power Company's service area and to reinforce the local distribution system.
Date	
a) Construction Start	2007
b) In-Service Date	2008
Is Certificate Necessary	Yes

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Loop existing Irvington Station to Vail Substation #2 line through future University of Arizona Tech Park Substation.
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Vail – Irvington Corridor
d) Point of Termination	Future U of A Tech Park Substation (physical location to be determined)
e) Length	Approximately 5 miles of double-circuited line
Routing	Loop existing Irvington – Vail #2 line into future U of A Tech Park substation
Purpose	To provide additional electric service to the U of A Tech Park expansion and the southern part of Tucson Electric Power Company's service area.
Date	
a) Construction Start	2009
b) In-Service Date	2010
Is Certificate Necessary	Yes

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

[Note: This project has been completed]

Line Designation	Tortolita – North Loop (Lines #117 and #118)
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	N/A
d) Point of Termination	N/A
e) Length	14.5 miles
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system.
Date	
a) Construction Start	2002
b) In-Service Date	2003
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Irvington – South and Irvington Drexel 138 kV (lines #105 and #130)
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	N/A
d) Point of Termination	N/A
e) Length	
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system.
Date	
a) Construction Start	2008
b) In-Service Date	2009
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Tortolita – Rancho Vistoso and Rancho Vistoso - La Canada 138 kV (lines #122 and #128).
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	N/A
d) Point of Termination	N/A
e) Length	N/A
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system during contingency operation.
Date	
a) Construction Start	2005
b) In-Service Date	2006
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	La Canada - Rillito 138 kV (line #120).
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	N/A
d) Point of Termination	N/A
e) Length	N/A
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system during contingency operation.
Date	
a) Construction Start	2007
b) In-Service Date	2008
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Rillito – Northeast 138 kV (line #124).
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	N/A
d) Point of Termination	N/A
e) Length	N/A
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system during contingency operation
Date	
a) Construction Start	2010
b) In-Service Date	2011
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	North Loop – Rillito 138 kV (line #114).
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	North Loop 138 kV Substation
d) Point of Termination	Rillito 138 kV Substation
e) Length	10.1 miles
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system during contingency operation
Date	
a) Construction Start	2006
b) In-Service Date	2007
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Vail – Los Reales 138 kV (line #108).
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Vail 138 kV Substation
d) Point of Termination	Los Reales 138 kV Substation
e) Length	4.6 miles
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system during contingency operation
Date	
a) Construction Start	2010
b) In-Service Date	2011
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Vail – Wilmot – Irvington Reconductoring 138 kV (line #136 and 101).
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Vail Substation
d) Intermediate Point	Wilmot 138 kV Substation
e) Point of Termination	Irvington 138 kV Substation
f) Length	Vail – Wilmot: 5.53 miles, Wilmot – Irvington: 5.53 miles
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system during contingency operation
Date	
a) Construction Start	2006
b) In-Service Date	2007
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Vail – Irvington #2 Reconductoring 138 kV (line #102).
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Vail 138 kV Substation
d) Point of Termination	Irvington 138 kV Substation
e) Length	11.0 miles
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system during contingency operation
Date	
a) Construction Start	2006
b) In-Service Date	2007
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	Irvington – 22nd Street Reconductoring 138 kV (line #140).
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	Irvington 138 kV Substation
d) Point of Termination	22nd Street 138 kV Substation
e) Length	3.40 miles
Routing	N/A
Purpose	Reconductor circuits to provide additional capacity on TEP's local 138 kV system during contingency operation
Date	
a) Construction Start	2004
b) In-Service Date	2005
Is Certificate Necessary	No

TUCSON ELECTRIC POWER COMPANY

10 YEAR PLAN

TRANSMISSION FACILITIES

Line Designation	22nd Street – East Loop Reconductoring 138 kV (line #145).
Size	
a) Voltage	138-kV
b) Capacity	System dependent
c) Point of Origin	22nd Street 138 kV Substation
d) Point of Termination	East Loop 138 kV Substation
e) Length	5.15 miles
Routing	N/A
Purpose	Lower distribution underbuild to provide additional capacity on TEP's local 138 kV system during contingency operation
Date	
a) Construction Start	2004
b) In-Service Date	2004
Is Certificate Necessary	No

RELIABILITY MUST-RUN GENERATION

TUCSON CONTROL AREA

FOR THE YEARS 2005, 2008, 2012

PREPARED FOR THE ARIZONA CORPORATION COMMISSION

Mary Ann Tilford
Transmission System Planning
Tucson Electric Power

December 4, 2003

TEP OPERATING CRITERIA AND OUTAGE RESPONSE

The TEP control area has historically been voltage stability constrained. Local Var-responsive steam units and combustion turbines can be committed in the Tucson load area to supply reactive support and to lower imports as necessary. In addition, TEP has an automated deterministic remedial action scheme that responds to selected single and double contingencies with pre-determined switching of reactive devices and / or direct load tripping. This remedial action scheme was designed assuming a fast collapse, and all actions take place in a maximum of .7 seconds after breakers open.

Fifty percent of customer load is available for arming for direct tripping, and there are three fast-switched reactive devices (RADs) available for arming. The fast-switched devices are the line reactor on the South end of the Westwing-South transmission line; two 44 MVar banks of capacitors on the 13.8 tertiary of the Vail 345/138 kV T1; and a 138kV, 39.6 MVar capacitor at Northeast Substation.

For single contingencies, the most economical combination of local generation and RADs is utilized to ensure that contingencies meet WECC / NERC voltage stability and reliability criteria, and TEP's internal voltage criterion of .98 per unit post-outage 138 kV average voltage.

RMR generation is in response to the reliability criterion defined by the Second Biennial Transmission Assessment, 2002-2011, which states "...reliability practices are founded on the principle of continuity of service for single contingency outages (N-1) of transmission lines." It should be noted that Tucson Electric Power Co. plans and operates its system to meet the WECC / NERC Reliability Criteria for both level B (N-1) and Level C (N-2; N-1-1) contingencies, as well as the WECC Voltage Stability Criteria.

Please note that the generating units formerly referred to as Irvington units, are now referred to as Sundt units.

BASE CASE DESCRIPTIONS:

All base cases used were co-developed by APS, SRP, TEP, WAPA, and SWTC. Planned system configuration changes for all these utilities were used to develop the various cases.

Below is a description of TEP's portion of the respective cases:

2005:

New Facilities:

Winchester 345kV Substation (2004)
Greenlee-Copper Verde 345 kV line (2004)
Gateway 345kV substation connecting to Citizens/Unisource 115 kV system at Valencia via a 345/115 kV transformer (2005)
Two 345 kV transmission lines between TEP's South and Gateway substations (2005)

Facility Upgrades:

Twenty-second / East Loop 138kV line upgraded from 225 MVA to 391 MVA (2004)
Twenty-second / Irvington 138kV line upgraded from 331 MVA to 444 MVA (2005)

Peak Load:

2000 MW (per official TEP forecast)

2008:

New Facilities:

Pinal-West 345 kV substation and interconnection to Westwing-South 345 kV line (2006)

Facility Upgrades:

Rillito / LaCanada 138kV line upgraded from 340 MVA to 356 MVA (2008)
North Loop / Rillito 138kV line upgraded from 287 MVA to 339 MVA (2008)

Peak Load:

2121 MW (per official TEP forecast)

2012:

New Facilities:

Tortolita – South 345 kV transmission line and associated 500/345 kV transformer at Tortolita (TBD)
Pinal West – Tortolita 500 kV line (TBD)

Facility upgrades:

Irvington / South 138kV line upgraded from 309 MVA to 394 MVA (2009)
Irvington / Vail #1 138kV line upgraded from 287 MVA to 356 MVA (2009)
Irvington / Vail #2 138kV line upgraded from 287 MVA to 356 MVA (2009)

Peak Load:

2287 MW (per official TEP forecast)

IMPORT TRANSMISSION ELEMENTS BY YEAR

Year	From	KV	To	KV	CK	30 Minute Rating
2005	Saguaro	500	Tortolita	500	1	806 MVA (xfmr)
	Saguaro	500	Tortolita	500	2	806 MVA (xfmr)
	Springerville	345	Vail	345	1	806 MVA (xfmr)
	Winchester	345	Vail	345	1	1858 Amp (CT/relay)
	Westwing	345	South	345	1	806 MVA (xfmr)
2008	Saguaro	500	Tortolita	500	1	806 MVA (xfmr)
	Saguaro	500	Tortolita	500	2	806 MVA (xfmr)
	Springerville	345	Vail	345	1	806 MVA (xfmr)
	Winchester	345	Vail	345	1	1858 Amp (CT/relay)
	Pinal-West	345	South	345	1	806 MVA (xfmr)
2012	Saguaro	500	Tortolita	500	1	806 MVA (xfmr)
	Saguaro	500	Tortolita	500	2	806 MVA (xfmr)
	Springerville	345	Vail	345	1	806 MVA (xfmr)
	Winchester	345	Vail	345	1	1858 Amp (CT/relay)
	Pinal-West	500	Tortolita	500	1	2560 Amp (wire)
	Pinal-West	345	South	345	1	806 MVA (xfmr)
	Tortolita	345	South	345	1	806 MVA (xfmr)

SIMULTANEOUS IMPORT LIMIT (SIL)

Year	SIL MW	MW Losses	Total MW	Critical Outage	Nature of Constraint
2005	1520	89	1609	Cholla – Saguaro 500 kV Line	WECC Voltage Stability Criteria
2008	1470	74	1544	South T2 345 / 138 kV Xfmr	Irvington / Vail 138kV line loading limit
2012	1770	116	1886	Springerville – Vail 345 kV Line	Internal Voltage Criterion

DISCUSSION:

In 2005, the limiting outage for the SIL is the Cholla-Saguaro 500 kV line; at higher loads than the SIL, the WECC voltage stability criteria (QV method) are not met. All of the fast-switched reactive devices were utilized for this outage.

In 2008, the limiting outage for the SIL is the South 345/138 kV transformer T2; at higher loads than the SIL, the Irvington / Vail 138 kV line is loaded above its rating. The Irvington-Vail lines are budgeted to be upgraded in 2009. The reason why the SIL is lower in 2008 than in 2005, is that the Pinal West interconnection increases flows on the western side of the transmission system, with more imports through the South T2, making its outage more severe. If the Irvington-Vail upgrade is moved to 2008, this limitation on the SIL will disappear.

In 2012, the limiting outage for the SIL is the Springerville-Vail 345 kV line; at loads higher than the SIL, the outage solved but did not meet the internal post-outage voltage criterion of .98 per unit. All of the fast-switched reactive devices were utilized for this outage.

There are no known particular external system load or generation patterns that impact the local SIL or RMR conditions.

LOCAL GENERATING UNITS DATA

Base Loadable	Min Dispatch	Max Dispatch	Qmin	Qmax
Sundt Unit #1	20 MW	77.5 MW	-15 MVar	80 Mvar
Sundt Unit #2	20 MW	77.5 MW	-15 Mvar	80 Mvar
Sundt Unit #3	25 MW	108.5 MW	-15 Mvar	65 Mvar
Sundt Unit #4	35 MW	118 MW	-30 Mvar	120 Mvar
DMP GT #1*	40 MW	73 MW	-15 Mvar	57 Mvar
DMP GT #2	40 MW	73 MW	-15 Mvar	57 Mvar
DMP GT #3	40 MW	73 MW	-15 Mvar	57 Mvar

Peaking	Min Dispatch	Max Dispatch	Qmin	Qmax
Sundt GT #1	22 MW	22 MW	-10 MVar	15 MVar
Sundt GT #2	22 MW	22 MW	-10 MVar	15 MVar
N. Loop GT #1**	20 MW	20 MW	0 MVar	0 MVar
N. Loop GT #2	22 MW	22 MW	-10 MVar	15 MVar
N. Loop GT #3	22 MW	22 MW	-10 MVar	15 MVar
N. Loop GT #4	22 MW	22 MW	-10 MVar	15 MVar

* DMP GTs are included as dispatchable units as opposed to peaking units because the MVar capacity combined with location has a significant benefit for voltage stability.

** N. Loop GT #1 is a jet engine with little MVar capacity.

TEP UNIT MAINTENANCE SCHEDULE
UPDATED
10/23/2003

TEP PLANTS		2005	2006	2007	2008	2009	2010
H.W. Sundt	**#1**	1/15-1/30	--------	--------	1/12-1/27	--------	--------
	#2	--------	--------	3/3-3/18	--------	--------	--------
	#3	--------	--------	2/17-3/4	--------	--------	--------
	#4	--------	1/7—2/5	--------	--------	1/10-2/1	--------
H.W. Sundt ICT's	**#1**	10/2-10/8	10/01-10/07	9/30-10/06	10/05-10/11	10/04-10/10	10/03-10/09
	#2	10/9-10/15	10/08-10/14	10/07-10/13	10/12-10/18	10/11-10/17	10/10-10/16
North Loop ICT's	**#1**	10/16-10/22	10/15-10/21	10/14-10/20	10/19-10/25	10/18-10/24	10/17-10/23
	#2	10/23-10/29	10/22-10/28	10/21-10/27	10/26-11/01	10/25-10/31	10/24-10/30
	#3	10/30-11/05	10/29-11/04	10/28-11/03	11/02-11/08	11/01-11/07	10/31-11/06
	#4	11/6-11/12	11/05-11/11	10/04-10/10	11/09-11/15	11/08-11/14	11/07-11/13
DMP GT		2/10-2/19	2/12-2/18	1/28-2/3	2/10-0/16	2/08-2/14	2/07-2/13
		--------	--------	--------	--------	--------	--------

PEAK LOAD: ANNUAL RMR CONDITIONS FOR 2005, 2008, 2012

Year	PEAK MW	MW Losses	Total MW	RMR MW	Critical Outage	Nature of Constraint
2005	2000	110	2110	178	South T2 345 / 138 kV Xfmr	Irvington / Vail 138kV line loading limit
2008	2121	99	2220	286	South T2 345 / 138 kV Xfmr	Irvington / Vail 138kV line loading limit
2012	2287	147	2434	119	Tortolita 500/138 Xfmr (#1 or #2)	Remaining Tortolita 500/138 kV Xfmr loading limit

DISCUSSION:

Many 138kV transmission lines were de-rated by TEP's Engineering department based on new, more conservative assumptions of temperature and wind speed / direction. Because of this, for 2005 and 2008, generation to relieve thermal overloads becomes as important as MVar availability for RMR conditions.

By the year 2012, all the de-rated 138kV lines needing upgrades will have been upgraded, relieving the thermal constraints on the 138 kV system as long as the less expensive Sundt Units are on line. By 2012 the EHV system will have sufficient new facilities that at peak, it is not voltage stability limited.

Unit commitment with minimum MW required, as well as least cost, was determined for the peak loads of the years studied. Below is a table showing the results. The least MW cost combination of units is shown in this table. Other generator combinations and attendant results are in the Generation Sensitivity Analysis section. Sundt Units #1 and #2 are equivalent in cost.

YEAR	Sundt #4	Sundt #3	Sundt #2	Sundt #1	Sundt #4 MW OUTPUT	Sundt #3 MW OUTPUT	Sundt #2 MW OUTPUT	Sundt #1 MW OUTPUT	TOTAL MW
2005	ON	ON			118	75			193
2008	ON	ON		ON	120	108.5		77.5	306
2012	ON	ON			110	50			150

GENERATION SENSITIVIY ANALYSIS

The effectiveness of the various generating units on relieving RMR conditions is complex for this study, because the de-rating of the 138kV lines has brought thermal overloads more to the forefront; depending on which units are on line, the constraint is either voltage stability or thermal overload, without a large differential in required generation. The difference in results is minimal.

2005 RMR Condition:

The first table is constant MW output with all MW being generated at the Irvington location. The most efficient combination is Sundt Units #3 and #4, which has the lowest loading on Irvington – Vail and also the best results for voltage after the Cholla-Saguaro outage. The least efficient combination is of Sundt Units #1 and #2 with both Irvington gas turbines also on line. The loading on the Irvington-Vail line is slightly higher, and the Cholla-Saguaro outage does not meet the .98 internal voltage criterion.

Generator #1	MW	Generator #2	MW	Generator #3	MW	Sundt CT MW	Total MW	Irv-Vail loading percent	Cholla-Saguaro 138 volts
Sundt #4	118	Sundt #3	75				193	100.1	1.0044
Sundt #4	118	Sundt #1	75				193	100.6	.9971
Sundt #1	70	Sundt #2	70	Sundt #3	53		193	100.6	.9854
Sundt #3	108	Sundt #1	63			22	193	100.9	.9892
Sundt #1	77	Sundt #2	72			44	193	101.7	.9663

The second table shows results for the same generated MW output, with MW being produced both at the Irvington location with various combinations of MW generated at DMP and at North Loop with gas turbines. Loading and voltage results vary slightly.

Generator #1	MW	Generator #2	MW	Sundt CT MW	DMP CT MW	NLoop CT MW	Total MW	Irv-Vail loading percent	Cholla-Saguaro 138 volts
Sundt #1	75	Sundt #2	74		44		193	102.2	.9936
Sundt #1	63	Sundt #3	108			22	193	101.8	.9938
Sundt #4	118			22	53		193	101.6	.9949
Sundt #4	118				53	22	193	102.6	.9951
Sundt #3	105			44	44		193	101.7	.9988

The last table shows results for the same generated MW output, if all MW are from gas turbines. Because the bulk of generation is not in the South end of the system, overloading is worse.

Sundt CT MW	DMP CT MW	NLoop CT MW	Total MW	Irv-Vail loading percent	Cholla-Saguaro 138 volts
44	63	86	193	105.6	.99

DISCUSSION:

Generation at Irvington is most effective at relieving the overload on the Irvington-Vail lines, caused by the outage of South T2. Sundt Units #4 and #3 are also best at providing Mvar support for post-outage 138 voltage from loss of Cholla-Saguaro. The gas turbines at North Loop and DMP are effective for providing voltage support for loss of Cholla-Saguaro, but less effective for relieving overloads on Irvington-Vail.

2008 RMR Condition:

The addition of the Pinal West interconnection increases flows on the Western side of the TEP system, decreasing flows from the North and East. Consequently, outage of the Cholla-Saguaro 500kV line decreases in severity, no longer showing up as a constraint in the RMR condition at peak. The constraint is loading on the Irvington-Vail line following an outage of the South T2. The most efficient generation for relieving the Irvington-Vail overloads is Sundt #3 and #4, with either Sundt #1 or #2. Some of the slight variation in overloads due to different units' being on line, is because the auxiliary load of the units are not exactly the same, and some of the generated MW must serve the unit's own auxiliary load. The Sundt units on the 46 kV system, #1, and #2, are less efficient at relieving Irvington-Vail overloads, but the percentage change is small.

Generator #1	MW	Generator #2	MW	Generator #3	MW	Sundt CT MW	DMP CT MW	NLoop CT MW	Total MW	Irvington-Vail Loading
Sundt #4	118	Sundt #3	108.5	Sundt #1	77.5				304	99.9
Sundt #1	77.5	Sundt #2	77.5	Sundt #3	105	44			304	100.3
Sundt #4	118	Sundt #3	108.5				73		299.5	102.2
Sundt #2	73	Sundt #2	72				73	86	304	106.5

2012 RMR Condition:

In 2012, there is a similar condition to 2005 in that both voltage and thermal constraints exist, with different generation combinations being more effective for each, but with a narrow variation in results. The first table shows combinations of Sundt steam units, with Units #1 and #2 having less voltage support after a Springerville-Vail outage. The least expensive Sundt Units, #3 and #4, are the most effective for relieving both constraints.

Generator #1	**MW**	**Generator #2**	**MW**	**Total MW**	**Tort xfmr load pct**	**SP-VL outage**
Sundt #4	110	Sundt #3	50	160	99.6	1.0019
Sundt #1	77.5	Sundt #2	77.5	155	99.1	.9692
Sundt #1	77.5	Sundt #3	82.5	160	98.7	.9878
Sundt #4	110	Sundt #1	50	160	98.7	.9989

The second table shows that generating the RMR MW at DMP and North Loop only, moves the thermal constraint from Tortolita (the generation is now on the North end of the system) back to Irvington-Vail. Also the lack of the MVar support from Sundt units does not support the post-outage voltage as well for the Springerville-Vail outage, causing it to not meet the internal .98 voltage criterion.

DMP CT MW	**NLoop CT MW**	**Total MW**	**Irvington-Vail Loading**	**SP-VL outage**
73	86	159	102.3	.9667

MAXIMUM LOAD SERVING CAPACITY (MLSC)

Year	MLSC MW	MW Losses	Total MW	MW Gen	Critical Outage	Nature of Constraint
2005	2420	131	2551	552	South T2 345 / 138 kV Xfmr	Irvington / Vail 138kV line loading limit
2008	2445	110	2555	629	South T2 345 / 138 kV Xfmr	Irvington / Vail 138kV line loading limit
2012	2720	152	2872	659	Tortolita 500/138 Xfmr (#1 or #2)	Remaining Tortolita 500/138 kV Xfmr loading limit

DISCUSSION:

As with the peak load, the de-rating of the 138kV lines had a significant impact on the ability to import power through the year 2008. Moving the upgrade of the Irvington-Vail lines to 2005 would raise the MLSC for 2005 and 2008.

However, in 2012, the 138kV system does not limit the load serving capacity of the Tucson Control area unless no Irvington steam units are on line. The MLSC is determined by outage of one of the Tortolita 500/138 kV transformers, which loads the remaining transformer. Voltage stability, tested via the WECC Voltage Stability Criteria, is not the limiting factor.

EFFECTIVENESS OF ALTERNATIVE SOLUTIONS

Please refer to jointly-reported CATS study results.

COMPARATIVE ANALYSIS OF ALTERNATIVE SOLUTIONS

It is clear that the upgrading of the de-rated 138kV Irvington-Vail transmission lines needs to be moved from 2009 to 2005.

As more IPPs continue to go in service, it is theoretically possible that TEP could import all power at peak and generate none locally, if sufficient 138kV transmission line upgrades and sufficient MVar availability could be made available either through SVC or synchronous condenser mode. However, a long-term cost-benefit analysis would have to be done, taking into consideration not only dollars saved on generation but dollars lost in losses and spent for upgrades and MVar support.

Of the combinations of local generating units that provided solutions to the RMR conditions, there is no significant difference in system losses, because the MW import variation is small among the choices, and the flows into the service area are nearly the same.

Summary SIL, MLSC, and Costs for dispatch to mitigate the annual RMR conditions for the years studied:

Wholesale Market Pricing and Incremental RMR Cost Impact	2005	2008	2012
Incremental RMR Dispatch Cost - Irvington Steam Gas ($/MWh)	7.63	10.62	17.85
Incremental RMR Dispatch Cost - DeMoss Petrie Gas Turbine ($/MWh)	1.08	3.99	10.68

Incremental RMR Generation Costs	2005	2008	2012
SIL	1600	1550	1850
MLSC	2500	2525	2800
Peak Load	2000	2121	2286
RMR	348	826	385
Annual Total	$ 68,061	$ 307,179	$ 301,885

DISCUSSION:

The RMR was determined with the assumption that all RMR units were operating on gas. Dollars shown are for gas fuel. In 2012, even though the RMR hours are considerably fewer than in 2008, the Annual Total cost is approximately the same due to projected increases in gas prices.

3Q - Natural Gas Pricing Assumptions	2005	2008	2012
Natural Gas Pricing ($/MMBTU)	$ 5.07	$ 5.13	$ 5.56

Total emission pollutants produced by the lowest local generation dispatch mitigating the annual RMR condition, for the years studied:

Environmental Summary

Annual pollutants are based on estimated RMR output as defined by the ACC data request, and not the incremental difference between the possible market alternative.

2005 RMR Environmental Output	Estimated SO2	Estimated NOx	Estimated PM	Estimated CO
Sundt Steam Gas (lbs)	30	7,679	230	901

2008 RMR Environmental Output	Estimated SO2	Estimated NOx	Estimated PM	Estimated CO
Sundt Steam Gas (lbs)	185	48,042	1,441	5,639
DeMoss Petrie Gas Turbine (lbs)	3	168	63	158
Sundt Gas Turbine (lbs)	0	11	4	10

2012 RMR Environmental Output	Estimated SO2	Estimated NOx	Estimated PM	Estimated CO
Sundt Steam Gas (lbs)	21	5,415	162	636